

Grade 11 - Informational

The Ogallala Aquifer

The western Great Plains region was once thought to be the Great American Desert. The area lacks sufficient precipitation, and there are not enough lakes and rivers to supply the region with water. By the 1940s, this land had flourished into a leading grain producer and has since become known as the nation's breadbasket. The change was due largely to a natural resource known as the Ogallala Aquifer.

What is an Aquifer?

A layer of rock or sediment beneath Earth's surface that stores and transmits groundwater is called an aquifer. Water from rain and snow seeps through the soil into the aquifer's porous surface. The water table is the upper layer of sediment, which is completely saturated. The water table varies with the depth of the aquifer and the amount of water removed from it. An impermeable layer of rock beneath the aquifer is tightly compressed, so it prevents the water from going farther.

The Ogallala Aquifer, with an approximate area of 174,000 square miles, is the world's largest known freshwater aquifer. It underlies southern South Dakota; most of Nebraska; about half of Kansas; parts of Wyoming, Colorado, Oklahoma, and New Mexico; and a large portion of the Texas panhandle. In some areas, the aquifer is about 400 feet deep, and in other areas, it is very shallow. The average depth is about 100 feet. The aquifer is estimated to hold more than 978 trillion gallons of water. That's about as much water as is in Lake Huron, the second largest of the Great Lakes.

History of the Aquifer

Many years ago, water flowing onto the sand and gravel of the plains formed the Ogallala Aquifer. As the Rocky Mountains were uplifted, streams flowed eastward. Melting glaciers also added to the water supply. Today the Ogallala Aquifer no longer has those sources to replenish it.

The Great Plains region receives an annual precipitation of only 12–24 inches of rain and snowmelt. That was adequate to maintain the underground water supply. Early settlers dug wells for their use and for watering their animals. These wells had no significant impact on the groundwater supply.

In the early 1900s, however, the Ogallala Aquifer was tapped for irrigation. Improved drilling techniques have made the dry grasslands suitable for growing corn, wheat, cotton, and other crops. About 16 million acres are irrigated from the Ogallala Aquifer. The grain ranchers feed their cattle depends on the water drawn from the aquifer. For a long time, people thought the supply of groundwater was inexhaustible.

Cause for Alarm

The naturally dry climate of the Great Plains is not profitable for most farming without irrigation. The amount of rainfall is inadequate to replenish the water withdrawn from the aquifer. In some regions, the water table has dropped 10–50 feet in depth. In extreme areas, it has dropped more than 100 feet. One environmentalist stated it was as if only a teacup of water was replaced for each gallon of water removed. In the Texas High Plains, about ten times as much water is pumped out as is replaced by rainfall. Some conservationists estimate that current irrigation practices could deplete about half of the water of the Ogallala Aquifer within a decade.

Pollution is also a problem for the aquifer. Runoff from agriculture has contaminated the groundwater supply in some areas. A geologic survey conducted in 2009 showed 90 percent of samples taken in Nebraska contained nitrates from fertilizers. Pesticides were also found in the groundwater.

Two major oil companies proposed a pipeline that would run directly through the Ogallala Aquifer. It would carry crude oil from the tar sands of Alberta, Canada, through the Nebraska Sandhills, to refineries along the Gulf Coast of Texas. Opponents pointed out that even a small leak could contaminate the water supply.

Potential Solutions

Open ditch irrigation is a wasteful use of groundwater. About half of the water pumped to the surface is lost through evaporation. Sprinklers are more efficient, yet irrigating at noon causes a loss of about 30 percent. Setting the systems to run in the early morning and in the evening reduces the loss to about 15 percent.

Drip irrigation, also called trickle irrigation, is the most efficient method of watering crops in dry regions. A network of pipes and narrow tubes releases water at the base of the plants allowing water to drip slowly to the roots. The evaporation loss is only about five percent. This method also minimizes erosion. In addition, since the leaves remain dry, there is less risk of disease to the plants.

However, drip irrigation has disadvantages. The initial cost of installing a system can be more expensive than overhead sprinklers. If the water is not filtered, or if the equipment is not maintained properly, the tubes may become clogged. Some fertilizers and herbicides do not work unless the soil is saturated, and extra labor is required to clean up fields after the crops are harvested.

The Ogallala Aquifer has benefited people for many years, but if present use continues, it may not sustain the needs of generations to come. Governmental and educational programs promote the use of efficient irrigation practices and encourage the utilization of recycled water sources. Conservation and improved technology are needed to preserve an amazing resource.

